UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/465,228	12/17/1999	BEOMSUP KIM	MP0014	8635

23624 7590 01/16/2004

MARVELL SEMICONDUCTOR, INC.
INTELLECTUAL PROPERTY DEPARTMENT
700 FIRST AVENUE, MS# 509
SUNNYVALE, CA 94089

EXAMINER	
SINGH, RAMNANDAN P	

ART UNIT	PAPER NUMBER
2644	19

DATE MAILED: 01/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/465,228	KIM, BEOMSUP	
	Examiner	Art Unit	
	Dr. Ramnandan Singh	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 1999* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *32-78* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *32-78* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 August 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Preliminary Amendment

1. Applicant's Preliminary Amendment filed on 21 August 2000 on page 25 recites, "**Claims 31-78** have been added." This is in error. The correct statement is: "Claims 32-78 have been added."

Drawings

2. The drawings filed on 17 December 1999 and 15 August 2000 are acceptable subject to correction of the informalities indicated on the attached "Notice of Draftsperson's Patent Drawing Review," PTO-948. In order to avoid abandonment of this application, correction is required in reply to the Office action. The correction will not be held in abeyance.

Status of Claims

3. Claims 1-31 are cancelled.

New Claims 32-78 are added.

Claims 32-78 are pending.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 32, 51, 70 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirano et al [US 5,396,554].

At the outset, it may be noted that Claim 32 claims an adaptation algorithm for **updating FIR filter coefficients** using two terms; weighted previous coefficient value plus a correction term involving a cross-correction between a receive signal and a delayed transmit signal. However, the adaptation algorithm is well-known in the art. In this context, Hirano et al teaches an apparatus shown in Figs. 1, 3, for canceling multi-channel echoes including acoustic echo and crosstalk interference [col. 1, lines 14-36; .col. 13, line 29 to col. 14, line 2; col. 17, lines 9-26]. The apparatus comprises an adaptive correlator circuit for calculating cross-correlation functions [col. 13, line 29 to col. 14, line 2], and finite impulse response (FIR) filters to simulate echoes [Fig. 5; col. 17, line 58 to col. 18, line 9]. Inherently, Hirano teaches an adaptation algorithm. For example, Bonnet et al [US 4,852,081] shows a typical form of an adaptation algorithm [Equation (4); col. 2, lines 14-22; Abstract]. To illustrate this cross-correlation technique for updating filter coefficients, Hirano uses a cross-correlation function between two reception signals, 213 and 214, as shown in Fig. 5, based on a tapped-delay line [col. 12, line 14 to col. 14, line 2; col. 14, line 26 to col. 15, line 2]. "While the multi-channel echo canceling apparatus 100 shown in fig. 3 is described **by way of example** in which the first and second reception signals 11 and 12 and the first and second mixed

signals 24 and 25 are involved, the present invention can be applied to other cases in which a plurality of reception signals and a single transmission signal or a plurality of transmission signals are involved" [col. 17, lines 9-20]. Further, while the multi-channel echo canceling apparatus is employed to cancel acoustic echoes derived from reception signals , it can be applied to also to the cancellation of crosstalk of a circuit [col. 17, lines 20-26]. In addition, Hirano et al teaches FIR adaptive filters, each having 40 taps [col. 17, line 58 to col. 18, line 10; col. 20, lines 7-28].

Claims 51 and 70 are essentially similar to Claim 32 and are rejected for the reasons stated above apropos of Claim 32.

6. (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 32, 38, 51, 57, 70, 76 are rejected under 35 U.S.C. 102(e) as being anticipated by Traill et al [US 6,078,567].

Regarding Claim 32, Traill et al teaches using cross-correlation of receive and transmit signals to determine filter coefficients for canceling echo and crosstalk interference shown in Figs. 1-3 [col. 1, lines 14-37; col. 2, line 31 to col. 3, line 31]. Inherently, Traill et al teaches an adaptation algorithm. For example, Bonnet et al [US 4,852,081] shows a typical form of an adaptation algorithm [Equation (4); col. 2, lines

14-22; Abstract]. The echo detection device 6 uses a cross-correlation technique to compare speech on the reflected and transmitted paths with a predetermined delay [col. 5, lines 58-67], wherein the predetermined delay can be determined using elemental delays imposed on the transmitted signal [col. 6, lines 1-27; col. 9, lines 22-25; col. 10, lines 10-13]. Traill et al also discloses using normalized signals for cross-correlation [col. 8, lines 22 –64]. In addition, **Traill et al simply refers to Taguchi [US 5,062,102] for more details** (which are inherently present in Traill et al), such as filter coefficient update equations based on a cross-correlation technique between the signals carried by first and second transmission lines [col. 2, lines 21-29], and **does not duplicate those equations of Taguchi in describing his instant invention**. In this context, Taguchi discloses cross-correlation coefficient calculator 24 for delivering the values of b_0 through b_n to the transversal filter 16 as the filter coefficients [Fig. 3; Equation 6; col. 5, lines 30-55; col. 7, lines 35-68].

Claims 51 and 70 are essentially similar to Claim 32 and are rejected for the reasons stated above apropos of Claim 32.

Regarding Claim 38, the use of a shift register in the FIR filter is well-known in the art. See Taguchi [Fig. 6, elements, 53 and 63; col. 8, lines 48-66; col. 9, lines 25-43; col. 12, lines 12-28].

Claims 57 and 76 are essentially similar to Claim 38 and are rejected for the reasons stated above apropos of Claim 38.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 41, 50, 60, 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hatamian [US 6,272,173 B1] in view of either Hirano et al [US 5,396,554] or Traill et al [US 6,078,567].

Regarding Claim 41, Hatamian teaches a communication apparatus comprising two gigabit transceiver 102 and 104 having transmitters and receivers, as shown in Fig. 1. Fig. 2 depicts the structure of the gigabit transceiver that includes a near-end crosstalk (NEXT) canceller block 230 having three constituent NEXT cancellers and an echo canceller 232 [col. 3, lines 45-52; col. 5, lines 41-57]. The adaptive filters used to implement the echo canceller 232 and the NEXT cancellers 230 are finite impulse response (FIR) filters [col. 6, line 63 to col. 7, line 64].

Hatamian does not teach applying a cross-correlation technique to update the FIR filter coefficients.

Hirano et al teaches an apparatus shown in Figs. 1, 3, for canceling multi-channel echoes including acoustic echo and crosstalk [col. 1, lines 14-36; .col. 13, line 29 to col. 14, line 2; col. 17, lines 9-26]. The apparatus comprises an adaptive correlator circuit for calculating cross-correlation functions [col. 13, line 29 to col. 14, line 2], and finite impulse response (FIR) filters to simulate echoes [Fig. 5; col. 17, line 58 to col. 18, line 9]. To illustrate this cross-correlation technique for updating filter coefficients, Hirano uses a cross-correlation function between two reception signals, 213 and 214, as shown in Fig. 5, based on a tapped-delay line [col. 12, line 14 to col. 14, line 2; col. 14, line 26 to col. 15, line 2]. "While the multi-channel echo canceling apparatus 100 shown in fig. 3 is described **by way of example** in which the first and second reception signals 11 and 12 and the first and second mixed signals 24 and 25 are involved, the present invention can be applied to other cases in which a plurality of reception signals and a single transmission signal or a plurality of transmission signals are involved" [col. 17, lines 9-20]. Further, while the multi-channel echo canceling apparatus is employed to cancel acoustic echoes derived from reception signals , it can be applied to also to the cancellation of crosstalk of a circuit [col. 17, lines 20-26]. In addition, Hirano et al teaches FIR adaptive filters, each having 40 taps [col. 17, line 58 to col. 18, line 10; col. 20, lines 7-28].

Traill et al teaches using cross-correlation of receive and transmit signals to determine filter coefficients for canceling echo and crosstalk interference shown in Figs. 1-3 [col. 1, lines 14-37; col. 2, line 31 to col. 3, line 31]. The echo detection device 6 uses a cross-correlation technique to compare speech on the reflected and transmitted paths with a predetermined delay [col. 5, lines 58-67], wherein the predetermined delay can be determined using elemental delays imposed on the transmitted signal [col. 6, lines 1-27; col. 9, lines 22-25; col. 10, lines 10-13]. Traill et al also discloses using normalized signals for cross-correlation [col. 8, lines 22 –64].

In addition, Trail simply refers to Taguchi [US 5,062,102] for more details, such as filter coefficient update equations based on a cross-correlation technique between the signals carried by first and second transmission lines [col. 2, lines 21-29], and does not duplicate those equations of Taguchi in describing his instant invention. In this context, Taguchi discloses cross-correlation coefficient calculator 24 for delivering the values of b_0 through b_n to the transversal filter 16 as the filter coefficients [Fig. 3; Equation 6; col. 5, lines 30-55; col. 7, lines 35-68].

Hatamian, Hirano et al, and Traill et al are analogous art because they are from a similar problem solving area, viz. , echo cancellation in telephonic communications.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the cross-correlation technique for canceling echo and crosstalk of either Hirano et al or Traill et al with Hatamian.

The suggestion/motivation for doing so would have been (i) to speed up the convergence of the FIR filter coefficients to their optimal values [Hirano et al; col. 8, lines 6-19], and (ii) to allow short samples of signals to be used and thereby allowing faster updates of the FIR filter coefficients [Traill et al; col. 2, lines 24-28].

Claim 60 is essentially similar to Claim 41 and are rejected for the reasons stated above apropos of Claim 41.

Claims 50 and 69 are essentially similar to Claim 41 except for a first hybrid and a second hybrid. These two hybrid transceivers are inherently present in Hatamian. For example, Azadet et al [US 6,584,159 B1] shows first hybrid transceiver 100 and second transceiver 120 [Fig. 1].

10. Claims 33-37, 39-40, 52-56, 58-59, 71-75, 77-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trailli et al as applied to claims 32, 51, 70, 38 , 57, 76 above, and further in view of Virdee [US 5,473,686].

Regarding Claims 33-34, Trailli et al does not teach expressly weighting the previous filter coefficients by a first predetermined weighting factor and a filter coefficient correction term by a second weighting factor.

Virdee teaches an adaptive algorithm (328), a LMS algorithm, for applying a first weighting factor (whose value is 1) and a second weighting factor β to obtain an updated coefficient, as shown in Fig. 3 [col. 3, lines 47-58].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the adaptation algorithm of Virdee to reduce the signal errors attributed by echoes including crosstalk [Virdee; col. 3, lines 56-58].

Claims 52-53 and 71-71 are essentially similar to Claims 33-34 and are rejected for the reasons stated above.

Regarding Claim 35, see Fig. 3 of Virdee.

Claims 54 and 73 are essentially similar to Claim 35 and are rejected for the reasons stated above apropos of Claim 35.

Claim 36 requires dividing the second weighting factor by a variance of the transmit signal. In reality, this amounts to normalizing the cross-correlation term. Trail et al uses a normalized cross-correlation term [col. 5, lines 58-63; col. 6, lines 1-7]. For example, Chevreau et al [US 4,571, 720] illustrates this point [Equation (2); col. 2, lines 32-50].

Claim 39 is essentially similar to Claim 36 and is rejected for the reasons stated above.

In Claim 37, a weighting factor is an inverse of a number of a group of the signals transmitted. This is well-known in the art. See Virdee [col. 8, lines 52-60].

Claim 40 is essentially similar to Claim 37 and is rejected for the reasons stated above.

Regarding Claims 55-56, 58-59, 74-75, 77-78, the limitations are shown above.

11. Claims 42-49, 61-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Hatamian and Traill et al as applied to claims 41, 60 above, and further in view of Virdee [US 5,473,686].

Regarding Claims 42-43, the combination of Hatamian and Trailli et al does not teach expressly weighting the previous filter coefficients by a first predetermined weighting factor and a filter coefficient correction term by a second weighting factor.

Virdee teaches an adaptive algorithm (328), a LMS algorithm, for applying a first weighting factor (whose value is 1) and a second weighting factor β to obtain an updated coefficient, as shown in Fig. 3 [col. 3, lines 47-58].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the adaptation algorithm Virdee to reduce the signal errors attributed by echoes including crosstalk [Virdee; col. 3, lines 56-58].

Claims 61-62 are essentially similar to Claims 42-43 and are rejected for the reasons stated above.

Regarding Claim 44, see Fig. 3 of Virdee.

Claims 63 are essentially similar to Claim 35 and are rejected for the reasons stated above apropos of Claim 35.

Claim 45 requires dividing the second weighting factor by a variance of the transmit signal. In reality, this amounts to normalizing the cross-correlation term. Trail et al uses a normalized cross-correlation term [col. 5, lines 58-63; col. 6, lines 1-7].

Regarding Claim 47, the use of a shift register in the FIR filter is well-known in the art. See Taguchi [Fig. 6, elements, 53 and 63; col. 8, lines 48-66; col. 9, lines 25-43; col. 12, lines 12-28].

Claim 66 is essentially similar to Claim 47 and is rejected for the reasons stated above.

Claim 48 is essentially similar to Claim 45 and is rejected for the reasons stated above.

In Claim 46, a weighting factor is an inverse of a number of a group of the signals transmitted. This is well-known in the art. See Virdee [col. 8, lines 52-60].

Claim 49 is essentially similar to Claim 46 and is rejected for the reasons stated above.

Regarding Claims 64-65, 67-68, the limitations are shown above.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(i) Lechleider [US 5,181,198] teaches coordinated transmission fpr tw-pair dgital subscriber lines [Figs. 1-7; col. 4, lines 40-64; Abstract];

(ii) Townsend et al [US 5,577,116] reaches using normalized samples [Fig. 1; col. 2, lines 16-35];

(iii) McKeown [US 4,561,067] teaches multi-channel crosstalk interference cancellation[Figs. 1-3; Abstract]; and

(iv) Sommen et al [US 4,807,173] uses the variance of a signal to normalize its sample [Fig. 1].

(v) Romesburg [US 6,570,985 B1], see equations (1) thru (12).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Ramnandan Singh whose telephone number is (703)308-6270. The examiner can normally be reached on M-F(8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester Isen can be reached on (703)-305-4386. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9314 for regular communications and (703)872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)306-0377.

Dr. Ramnandan Singh
Examiner
Art Unit 2644

January 3, 2004

FORESTER W. ISEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2650